What is claimed is:

1. A series active power line conditioner, comprising:

an isolation transformer having a primary winding and a first secondary winding, said primary winding for receiving power from a source of alternating current power; and

a feedback control loop comprised of a voltage reference, an output sampler, and an amplifier, said output sampler functioning to provide a scaled sampling of the output voltage of said power line conditioner to a first input of said amplifier, said voltage reference connected to provide a desired voltage to a second input of said amplifier; an output of said amplifier connected to a first terminal of said first secondary winding of said isolation transformer, and a second terminal of said first secondary winding of said isolation transformer connected to an input of said output sampler, said second terminal of said first secondary winding of said isolation transformer also constituting the output of said power line conditioner.

2. The power line conditioner of claim 1 wherein the terminals of said primary winding of said isolation transformer are connected to a first port of the power line conditioner, said first port also in communication with an AC power source; and

said second terminal of said first secondary winding of said isolation transformer wired to a second port of the power line conditioner, said second port adapted for connecting one or more loads to said second port of the power line conditioner.

3. The power line conditioner of claim 2 wherein said isolation transformer has a second secondary winding having current capability equal to that of said first secondary winding, said second secondary winding providing power to said amplifier of said feedback control loop, whereby voltage deficiencies in the incoming AC power are corrected by said amplifier utilizing the additional voltage contributed by said second secondary winding.

4. The power line conditioner of claim 3 wherein said amplifier is a differential amplifier having first and second inputs and an output port, said first input operating as a non-inverting input such that excitations presented to said first input are amplified by said amplifier with substantially zero phase shift, said second input operating as an inverting input such that excitations presented to said second input are amplified by said amplifier with substantially 180 degrees of phase shift; and

said output sampler wired between said output port of the power line conditioner and said inverting input of said amplifier, said output port of said amplifier wired to said first terminal of said first secondary winding of said isolation transformer, said second terminal of said first secondary winding of said isolation transformer constituting said output of the power line conditioner, the loop formed by said first secondary winding, said output sampler, and said amplifier operating to provide said amplifier with substantially negative feedback.

5. The power line conditioner of claim 4 wherein said output sampler comprises a voltage divider network.

6. The power line conditioner of claim 5 wherein said voltage reference is derived from a sampling of the incoming AC power and is substantially purified of harmonic, spurious, and random noise by a filter.

7. The power line conditioner of claim 5 wherein a passive network comprised of at least one capacitor is connected in parallel with said first secondary winding of said isolation transformer.

8. The power line conditioner of claim 7 wherein said passive network is comprised of a series connected resister and capacitor.

9. The power line conditioner of claim 4 wherein said output sampler is comprised of at least one resister and at least one capacitor, the gain of said output sampler being frequency dependent according to a time constant associated with said resister and said capacitor, the gain of said output sampler being measurably higher above than below a corner frequency associated with said time constant.

10. The power line conditioner of claim 9 wherein said output sampler contains a network comprised of a series connected resister and capacitor, said network connected between the input and the output of said output sampler.

11. The power line conditioner of claim 4 wherein a third input port is formed at a first terminal of a capacitor, a second terminal of said capacitor being connected to said

non inverting input of said differential amplifier, said third input port being connected to the shield of at least one shielded cable by which connection is made between said differential amplifier and other components of said feedback control loop.

12. The power line conditioner of claim 4 wherein said differential amplifier is comprised of a integrated circuit operational amplifier and a high current push pull output stage, the output of said integrated circuit operational amplifier being coupled to the input of said push pull output stage so as to form a differential amplifier of higher output current capability compared to the current capability of the integrated circuit operational amplifier.

13. The power line conditioner of claim 12 wherein a passive network comprised of at least one capacitor is connected to an output terminal of an active device used to perform amplification in said output stage and a terminal of a power supply used to bias said active device.

14. The power line conditioner of claim 13 wherein said passive network is comprised of a series connected resister and capacitor.

15. The power line conditioner of claim 12 wherein at least one diode is wired between the output of said integrated circuit operational amplifier and the input of said output stage, the polarity of said diode determined so as to permit the passage of output current from the output of said operational amplifier to the input of said output stage, the

same polarity also providing blockage to current associated with the quiescent bias conditions of active devices used within said output stage to perform amplification.

16. The power line conditioner of claim 6 wherein said filter utilizes a voltage comparator for compressing a sampling of the incoming AC power into a substantially square wave.

17. The power line conditioner of claim 16 wherein a first and second power supply rail of said comparator is derived from the output of a first and second operational amplifier, respectively, the outputs of said operational amplifiers being wired to their respective inverting inputs so as to provide a voltage follower function in each of said operational amplifiers.

18. The power line conditioner of claim 16 wherein said voltage comparator operates from rail voltage supplies that are derived from a sampling of the incoming AC power in such a way that said rail voltage supplies effectively track the amplitude of the incoming AC power, the end result of which is a voltage comparator whose square wave output tracks the average amplitude of the incoming AC power.

19. The power line conditioner of claim 6 wherein said filter includes at least one operational amplifier configured to operate as a low pass filter.

20. The power line conditioner of claim 6 wherein said filter includes at least one 8th order low pass active filter.

21. The power line conditioner of claim 6 wherein said filter includes at least one passive resister-capacitor low pass filter.

22. The power line conditioner of claim 6 wherein said isolation transformer includes third and fourth secondary windings, said third secondary winding having substantially identical number of turns as said first secondary winding, said fourth secondary winding having substantially identical number of turns as said second secondary winding, wherein also,

said feedback control loop appears in duplicate as first and second feedback control loops, said first loop connected to said first and second secondary windings of said isolation transformer to form a first half of a balanced output power line conditioner, said second loop connected to said third and fourth secondary windings of said isolation transformer to form a second half of said balanced output power line conditioner, said third and fourth secondary windings of said isolation transformer connected to said second half of said balanced output power line conditioner in opposite phase with respect to said first half of said balanced output power line conditioner, said first half and said second half operating together to provide a balanced output voltage with respect to a common ground connection between said first half and said second half, without respect to the balanced or unbalanced nature of the circuit associated with said primary winding of said isolation transformer.

23. The power line conditioner of claim 22 wherein said voltage reference includes a phase splitter functioning to provide antiphase outputs from said voltage reference, said phase splitter being comprised of a first operational amplifier wired as a conventional non-inverting amplifier, and a second operational amplifier wired as a conventional inverting amplifier.

24. The power line conditioner of claim 22 wherein a first passive network including at least one capacitor is wired between a first output of said balanced output power line conditioner and said common ground, and a second passive network including at least one capacitor is wired between a second output of said balanced output power line conditioner and said common ground.

25. The power line conditioner of claim 24, wherein said first and second passive networks include at least one series connected resister and capacitor.